International Journal of Research
ISSN: 2348-6848 Vol-3, Special Issue-3
International Conference on Research and Recent Trends in Engineering and Technology. (ICRRTET)
Held on 27th January 2016 organized by **Sai Polytechnic College,** Kinhi Jawade, Yavatmal, Maharastra, India.

"Design & Implementation of Parameter Monitoring &Controlling of Induction Motor & Transformer using Gsm with Plc"

Prof. M.B.Golait; Umesh Kumar Choudhary; Digambar Vaidya;Pawan Nuprojwar & Govinda Marthe

Assistant Professor Dept of ETRX, SSPACE, Maharashtra, India, mgolait123@gmail.com
Student, Electronics, Sspace, Maharastra, India, umesh7913 @gmail.com
Student,Electronics, Sspace, Maharastra, India, vaidyadigambar94@gmail.com
Student,Electronics, Sspace, Maharastra, India, pawannuprojwar676@gmail.com
Student,Electronics, Sspace, Maharastra, India, govindamarthe@gmail.com

Abstract

This project at monitoring the temperature, current and voltage in induction motors and transformer in real time by employing wireless sensor networks (WSNs). A PLC base system is employed for acquiring electrical signals from the motor and transformer in a non invasive manner, and then performing local processing for torque and efficiency estimation. The values calculated by the PLC system are transmitted to a monitoring unit through GSM network. At the base unit, various motors can be monitored in real time. An experimental study was conducted for observing the relationship between the WSN performance and the spectral occupancy at the operating environment .The proposed model has a supervisor mobile which Communicates with the remote terminal unit. Processing the variable parameters and controlling the systems.

KEYWORDS: GSM; Induction motor; Transformer; PLC; ATMEGA-16; Monitoring parameters

1. INTRODUCTION

The aim of this research paper is to monitor the parameters of induction motor and transformer because of the fast growth in the application of induction motor and transformer in sensitive areas such as nuclear power plants, has increased need of continuous condition for monitoring of motor and transformer .Condition monitoring of electrical machines and drive system is a vital factor to achieve efficient and profitable operation of large variety of industrial process. Similarly parameter estimation is important for the machine designer, invaluable to the operator of modern drives implementing various types of controllers. It is also necessary to know machines parameters for a numbers of simulation.Condition monitoring of induction motor and transformer have been a challenging task for engineers and researchers mainly in industries. There are many conditions monitoring methods including vibration monitoring, thermal monitoring, chemical monitoring all these monitoring methods required expensive sensors or specialized tools whereas parametric monitoring of induction motor and transformer using GSM does not required additional sensors.We are used AVR microcontroller in which we used embedded system for its programming and its operation . In AVR microcontroller it gives internal flash programmable memory of 16 kb and inbuilt 512 bytes EEPROM and it contains four ports for its operation. This also contains AVR controller which generates controlled signals which is transmitted to PLC also makes use of mobile frequency band provides complete automation .This architecture is more efficient while achieving thought put to ten times faster than CISC microcontroller. It monitored over voltage, over current ,over speed, over temperature , ATMEGA-16 which communicates with GSM and GSM send message to the user. Condition monitoring of induction motor and transformer is a process that may be used to great advantage in agricultural field and in the industrial application also. To provide reliable condition monitoring and protection of motor and transformer this paper represents parametric monitoring which is useful in the following areas – thermal protection,

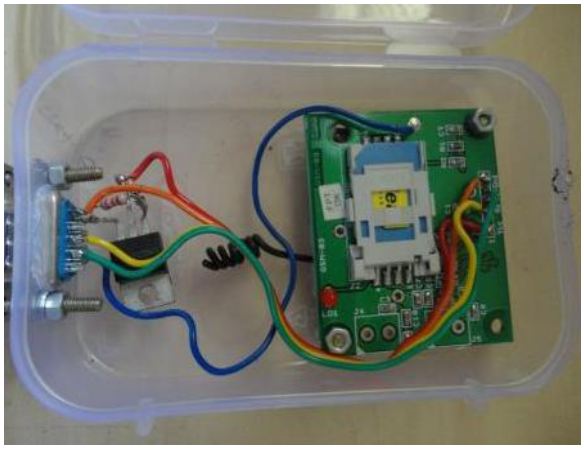
temperature estimation, fault detection. For each category related feature of motor and transformer are discussed in terms of their robustness, accuracy and implementation complexity. In this paper we used components namely as GSM, LM 35, LCD, Power supply, Induction motor, PLC.

2. GSM/GPRS MODEM

GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a **SIM (Subscriber Identity Module)** card just like mobile phones to activate communication with the network. Also they have **IMEI** (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:

1. Receive, send or delete SMS messages in a SIM.
2. Read, add, search phonebook entries of the SIM.
3. Make, Receive, or reject a voice call.

GSM MOULE



3. THE ATMEGA16 MICROCONTROLLER

The ATmega16 microcontroller used in this lab is a 40-pin wide DIP (**D**ual **I**n **l**ine) package chip. This chip was selected because it is robust, and the DIP package interfaces with prototyping supplies like solder less bread boards and solder-type boards. This same microcontroller is available in a surface mount package, about the size of a dime. Surface mount devices are more useful for circuit boards built for mass Production.

4. LCD (Liquid Crystal Display)

The display used is 16x2 LCD (Liquid Crystal Display); which means 16 characters per line by 2 line. The standard is referred as HD44780U, which refers to the controller chip which receives data from an external source (Here Atmega16) and communicates directly with the LCD. Here 8-bit mode of LCD is used, i.e., using 8-bit data bus. The three control lines are **EN**, **RS**, and **RW**. For sending data to the LCD, the program should make sure that the line is low (0) and then set the other two control lines or put data on the data bus. When the other lines

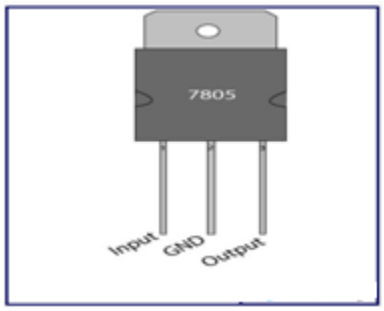
5. PROGRAMMABLE LOGIC CONTROLLER

A PLC or a programmable controller is a small computer used for au5omation of real-world processes, such as control of machinery on factory assembly lines. A PLC can be programmed to sense, activate, and control industrial equipment. Therefore, a PLC incorporates a number of I/O points, which allow electrical signals to be interfaced. Input and output components of the processes are connected to the PLC; and the control program is loaded on the PLC memory. The PLC measures the current, the voltage, the temperature, and the speed of an induction motor through analog inputs. In addition, it continuously monitors the inputs and activates the outputs according to the program

6. VOLTAGE REGULATOR (7805)

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output .The voltage regulator IC maintain the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide.7805 provides +5V regulated power supply

.Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.



7. CURRENT SENSOR

A current sensor is a device that detects electric current (Ac Or DC) in a wire, and Generate a signal could be analog voltage or current or even digital output. It can be then utilized to display the measured current in an ammeter or can be stored for further analysis in a data acquisition system or can be utilize for control purpose.

8. VOLTAGE SENSOR

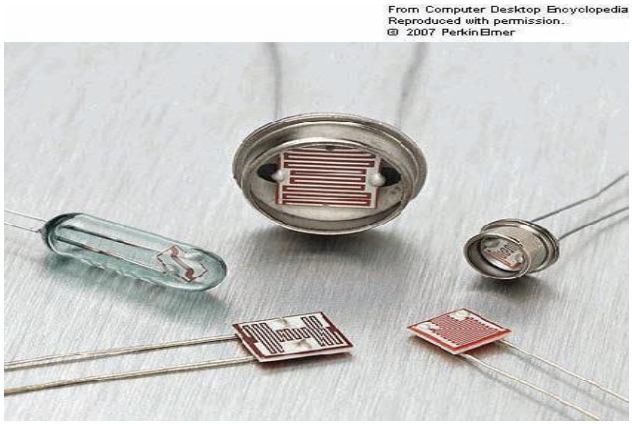
The block represent an ideal voltage sensor ,that is ,a device that convert voltage measured between any electrical connection into a physical signal proportional to the voltage.

9. POWER SUPPLY

Power supply is the circuit from which we get a desired dc voltage to run the other circuits. The voltage we get from the main line is 230V AC but the other components of our circuit require 5V DC. Hence a step-down transformer is used to get 12V AC which is later converted to 12V DC using a rectifier. The output of rectifier still contains some ripples even though it is a DC signal due to which it is called as Pulsating DC. To remove the ripples and obtain smoothed DC power filter circuits are used. Here a capacitor is used. The 12V DC is rated down to 5V using a positive voltage regulator chip 7805. Thus a fixed DC voltage of 5V is obtained.

10. LIGHT DEPENDENT RESISTOR

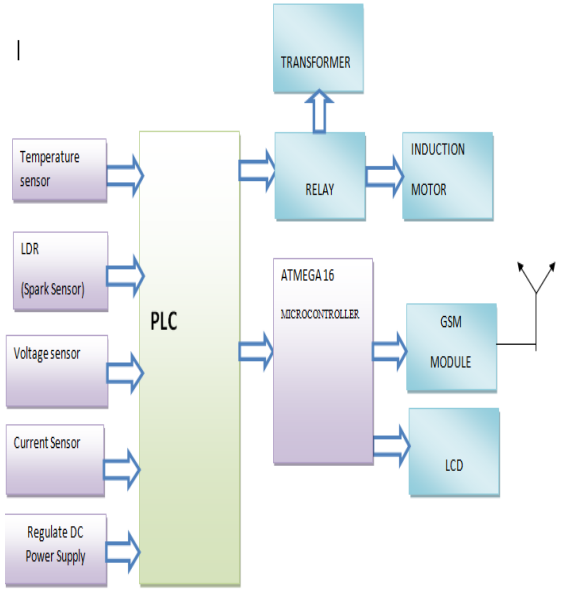
A light dependant resistor also known as a LDR, photo resistor , photoconductor or photocell, is a resistor whose resistance increases or decreases depending on the amount of light intensity. LDRs (Light Dependant Resistors) are a very useful tool in a light/dark circuits. A LDRs can have a variety of resistance and functions



11. HISTORY

Before technology for monitoring parameter are wired not wireless another for controlling devices 8051 or PIC family microcontroller used.AC induction motors (IMs) are used as actuators in many industrial processes. Although IMs are reliable, they are subjected to some undesirable stresses, causing faults resulting in failure. Monitoring of an IM is a fast emerging technology for the detection of initial faults. It avoids unexpected failure of an industrial process. Monitoring techniques can be classified as the conventional and the digital techniques. Classical monitoring techniques for three-phase IMs are generally provided by some combination of mechanical and electrical monitoring equipment. Mechanical forms of motor sensing are also limited in ability to detect electrical faults, such as stator insulation failures. In addition, the mechanical parts of the equipment can cause problems in the course of operation and can reduce the life and efficiency of a system. In study, a computer based protection system has been introduced. Measurements of the voltages, currents, temperatures, and speed were achieved and transferred to the computer for final protection decision. In this paper, although all the variables of the motor were considered, usage of an analog-to-digital conversion (ADC) card increases the cost and the size of the system. A programmable integrated circuit (PIC).

12. BLOCK DIAGRAM



In above system there are two sections one is the transmitter section and another is the receiver section. The transmitter section consists of oil level sensor, temperature sensor, over voltage and under voltage sensor. The output of that sensor connected to the microcontroller. In this Project we used AVR family atmega16 microcontroller. There is also LCD display which show transformer parameter like temperature, oil level and voltage. There also Relay connected to the transformer. If any condition goes to the above then relay trigger and switch off transformer. There is also another facility for monitoring transformer parameter. There is GSM transmitter module, that module transmit parameter related to the transformer. On other receiver side for receiving signal there is GSM receiver which is connected to monitoring PC. The GSM connected to the PC using USB to ttl converter. The function of USB to ttl converter is that it converts 0 to +5v in to -5 to +5 v. There is software for monitoring parameter related to the transformer. develop software using dot net.

13. WORKING:

1. In transformer monitoring system using GSM, we use different types of sensor. There is LDR sensor, detect spark in the transform or in the induction motor.

2. Temperature sensor measure temperature of the transformer. The output of temperature sensor given to the microcontroller. When temperature of transformer increases beyond predefine value then output of microcontroller to PLC become low and relay become open and transformer off. Similarly temperature of transformer continuously monitor by control room using GSM.

3. To protect transformer from over voltage and under voltage, we use fan regulator for varying the voltage. With the help regulator first we vary the voltage, when voltage decreases than 160v then microcontroller trip the transformer .If voltage increases beyond 220 v then relay become off and we protect transformer from under voltage and over voltage.

4. There is GSM transmitter on the transformer side and which take the data from various sensor that mounted on transformer. On the receiver side there is Mobile continuously take the data from the sensor.

14. TRANSFORMER FAULT ANLYIS

A power transformer consists of a set of windings around a magnetic core. The windings are insulated from each other and the core. Operational stresses can cause failure of the transformer winding, insulation, and core. The power transformer windings and magnetic core are subject to a number of different forces during operation:

1. Expansion and contraction caused by thermal cycling
2. Vibration caused by flux in the core changing direction
3. Localized heating caused by eddy currents in parts of the winding induced by magnetic flux
4. Impact forces caused by fault currents.
5. Thermal heating caused by overloading.

These operating limits only considered the thermal effects of transformer overload. Later, the capability limit was changed to include the mechanical effect of higher fault currents through the transformer. Power transformer faults produce physical forces that cause insulation wear. These effects are cumulative and should be considered over the life of the transformer.[ss2]. The following discussion highlights on different capability limits of transformer

15. OUR TEMPERATURE

Excessive load current alone may not result in damage to the transformer if the absolute temperature of the windings and transformer oil remains within specified limits. Transformer ratings are based on a 24-hour average ambient temperature of 30°C (86°F). Due to over voltage and over current, temp.

of oil increases which causes failure of insulation of transformer winding.

16. FUTURE SCOPE

More sensor interface for protection of induction motor. Wirelessly monitor using WI-FI on SCADA. Multiple motor monitor on single screen using GSM technology.

17. CONCLUSION

In this project, a protection system has been designed for safeguarding induction motors and transformer against all possible faults. Sensors are used to keep tabs on temperature, Spark. A current and voltage transformer is used in the system to check the current and voltage respectively. Assuming that any error is seen throughout online operation of the motor, a cautioning message send to the relative person afterward the motor is halted. The test has been successful in locating the shortcomings and in recouping them. PLC based protection system is far better that the other protection systems which use timers, contactors, current and voltage relays.

18. REFERENCES

[1] In July 2009,Ganapathy Subramanian Lih-Heng, S.H proposed Fault Detection and Protection of Induction Motors Using Sensors.

[2] In Jun 2013, Mrs.Jignesha Ahirproposed Design and Development of PLC and SCADA Based Control Panel for Continuous Monitoring of 3-Phase Induction Motor.

[3]April 2014,Sujith John Mathew proposed Fault Identification and Protection of Induction Motor using PLC and SCADA.

[4] December 2013 , Ravi Masandproposed Fault Diagnosis Of Induction Motor Using Plc.

[5] March-April, 2015 ChetanBorse proposed PLC Based Induction Motor Starting and Protection

[6] Yang,W,Tavner, P.J and Crabtree , C .J . 2009.‖An intelligent approach to condition monitoring of large scale wind turbines, European wind energy conference, scientific track.

[7]. Jyotishman Pathak, Yuan Li, Vasant Honavar and James D. McCalley, "A Service-Oriented Architecture for Electric Power Transmission System Asset Management", In ICSOC Workshops, pp: 26-37, 2006.

[8]. B. A. Carreras, V. E. Lynch, D. E. Newman and I. Dobson, "Blackout Mitigation Assessment in Power Transmission Systems", Hawaii International Conference on System Science, January 2003.

[9]. Xiaomeng Li and Ganesh K. Venayagamoorthy, "A Neural Network Based Wide Area Monitor for a Power System", *IEEE Power Engineering Society General Meeting*, Vol. 2, pp: 1455-1460, 2005.

[10] Atmel Corporation, “AT 89S51”, literature journal published, CA, December 2003 3. National Semiconductor Corporation, “Voltage Regulator LM 7805” journal published, America, May 2003.

[11] R.P.Jain, “Modern Digital Electronics”, TMH Publication 2003